more than three and a half minutes, the motion of *Eros* could be entirely neglected and their variations from the mean treated as purely accidental errors of measurements.

In this way I found that the average probable error for the mean of ten settings was ± 0″.053, the smallest being ± 0″.036, and the largest 0″.085. During the evening measures the observing conditions were about the average. In the morning the seeing was poor. The average probable error for the evening observations was ± 0″.046, and for the morning ± 0″.058. The distances of the stars from *Eros* varied from 19″ to 133″, and their magnitudes from 9.1 to 12. In both evening and morning observations the two comparison-stars were on opposite sides of *Eros* in Right Ascension. Of the one hundred and eighty settings, eight give residuals from the mean of ten that exceed 0″.50, the largest being —0″.67.

As this use of the measures was not thought of until after they had been made, the results here given may be considered as fairly representing the accuracy, so far as accidental error of measurement is concerned, of my entire series of micrometer measures of *Eros*. R. G. AITKEN.

THE CROCKER ECLIPSE EXPEDITION TO SUMATRA.

The Crocker Eclipse Expedition to Sumatra sailed from San Francisco on February 19th, on the Nippon Maru. The expedition is in charge of Acting Astronomer C. D. PERRINE, who is accompanied by Assistant R. H. CURTISS. The Nippon reached Yokohama on March 11th, two days behind schedule time, unusually heavy weather having prevailed almost continuously. A cablegram from Mr. PERRINE was received at the Lick Observatory on April 5th, announcing the arrival of the expedition at Padang. The eclipse occurs May 17, $9^h\ 29^m$ P.M., Pacific standard time.

Weather permitting, it is hoped to secure observations with the following instruments:—

1. Five-inch aperture, 40-foot focus, Clark photoheliograph lens, for recording the details of the inner corona. The exposures will vary from ¼ second up to 2½ minutes, the latter on 18 × 22-inch plates.

2. Five-inch aperture, 67-inch focus, Floyd (Clark) photographic telescope, for securing a series of photographs showing the general features of the corona.

3. Six-inch aperture, 32.6-inch focus, Pierson (Dallmeyer) quadruplet camera, for recording the outer portions of the corona.

4. One-inch aperture, 20¾-inch focus camera, with a large double-image prism in front of its lens; separating the two images about 1¼ degrees. It is hoped that a long and a short exposure can be secured in each of five positions of the prism differing 22½ degrees in position-angle from each other, successively.

In this connection, it may be said that no phase of eclipse work is now more prominent or more important than that of measuring the proportion of polarized light in the corona. The outcome of the numerous discussions in the technical journals has simply been to emphasize the necessity of securing more observations with all the instruments heretofore employed for this purpose. I must confess that the polarization effects observed by some at the eclipse of May 28, 1900, are so strong as to excite suspicion that the results are at least in part of instrumental origin. Granting that the coronal light is largely reflected sunlight, it seems to me that the planes of polarization should not be strongly marked. A reflecting or refracting particle of the corona, situated less than 10′ of arc from the Sun's edge, must be receiving illumination from every visible point of the photosphere, and therefore from a multitude of very different directions. Again, the observation includes not only one illuminated point, but a long line of points lying in the line of sight. For regions reasonably near the Sun's edge, how can the planes of polarization be clearly defined to the extent of revealing a large proportion of polarized light?

5. An efficient one-prism spectrograph, slit radial to Sun, for recording the bright and (possible) dark-line spectrum of the corona, and for the bearing of the results on the question of polarization.

6. An efficient one-prism spectrograph, slit tangential to the Sun, to supplement the preceding instrument.

7. A battery of four* photographic telescopes, 3-inch aperture, 11 ft. 4 in. focus, for recording a possible planet (or planets) *Vulcan*. These are mounted in a large polar axis driven by a clock at the end of a 10-foot sector driving-arm, in such a way that two of them will point east of the Sun, and the other two west of it. It is planned to secure photographs in duplicate of a

*Two of the lenses were kindly loaned by Harvard College Observatory.

strip of sky along the Sun's equator about $7° \times 35°$. Successful photographs should record all stars and planets in this region as bright as the 8.5 magnitude. The instrument was set up at Mt. Hamilton in February, and photographs of this same region of sky were taken without the Sun and the hypothetical planets in it. A comparison of the two sets of plates should promptly lead to the discovery of any planet as bright as the 8.5 magnitude which the Sun may have brought into this region of the sky.

The long duration of this eclipse, 6½ minutes, and the probable darkness of the sky, make this the pre-eminent occasion for the *Vulcan* search by photography. At the eclipses preceding 1900, many observing parties secured photographs for this purpose, with short-focus cameras; but owing to the brightness of the sky, and to the short focal lengths employed, the stars recorded were not fainter than the fourth or fifth magnitude; and no unknown objects were recorded. Several observers appear to have been interested in the problem of recording fainter objects, and to have reached similar solutions almost simultaneously. In the month of January, 1900, Mr. PERRINE came to my office to say that he had designed a telescope for efficiency in searching for *Vulcan;* and I was able to say that I had come to a conclusion on the same question. We compared results, and found them very similar. If I remember correctly, Mr. PERRINE'S design called for a 6-inch aperture and 16-foot focus. My dimensions were 5-inch aperture and 15-foot focus. The aim of both had been to reduce the sky-brightness on the plate by increasing the focal length far beyond what we had previously employed at the Indian and other eclipses. On account of the expense of constructing several such instuments, of our distance from manufacturers, of the short duration of the Georgia eclipse ($1^m\ 25^s$), and of the fact that the expedition would have to start early in April, we decided to plan the instruments for use in Sumatra; and Professor KEELER was spoken to with that in view. Professor WM. H. PICKERING, of Harvard College Observatory, was busy at the same time with a practical solution of the same problem. His results, and plans for employing them at the Georgia eclipse, were published in March, 1900; and two of his four lenses are to be used by Mr. PERRINE in Sumatra. We should have liked to secure lenses of about the dimensions originally planned for by Mr. PERRINE and myself; but the uncertainty as to whether observers could be spared for the

Sumatra expedition was not resolved until January, 1901, too late for the full realization of our ideas.

Lenses of the dimensions planned by Professor PICKERING were employed by several parties in 1900; but so far as I am aware no results have been published. W. W. CAMPBELL.

SCIENTIFIC VISITORS TO THE LICK OBSERVATORY.

The Lick Observatory had a pleasant, but far too brief, visit from the members of the U. S. Naval Observatory and Smithsonian Institution Expeditions to Sumatra, on the afternoon of February 14th. The party included Professor A. N. SKINNER, in charge of the U. S. Naval Observatory Expedition, and Mr. C. G. ABBOT, in charge of the Smithsonian Expedition; Professor E. E. BARNARD, of Yerkes Observatory; Professor W. S. EICHELBERGER, and Assistant Astronomers F. B. LITTELL and G. H. PETERS, of the Naval Observatory; Dr. MITCHELL, of Columbia University; Mr. H. D. CURTIS, of the University of Virginia; and Mr. L. E. JEWELL, of Johns Hopkins University.

Mr. W. R. WARNER, of the well-known firm of WARNER & SWASEY, accompanied by Mrs. WARNER, spent the 26th and 27th of March at Mt. Hamilton, much to the gratification of the members of the staff.

It was a pleasure to be able to show Mr. WARNER that the great telescope is in its original satisfactory condition, — perhaps with some improvements added.

Dr. ARTHUR T. HADLEY, President of Yale University, accompanied by Mrs. HADLEY, visited the Observatory on the night of March 27th. W. W. C.

CHANGES IN THE STAFF OF THE LICK OBSERVATORY.

The Board of Regents of the University of California, at the regular quarterly meeting on March 12th, took action affecting the Lick Observatory staff, as follows:—

Assistant Astronomer C. D. PERRINE was relieved from the duties and title of Secretary.

The title of Acting Astronomer was conferred upon C. D. PERRINE, to hold during his absence from the Observatory, on the Crocker Eclipse Expedition to Sumatra.

Mr. RALPH HAMILTON CURTISS, recently Student Assistant in the Students' Observatory of this University, was appointed